

California Regional Water Quality Control Board
Santa Ana Region

June 1, 2001

ITEM: 17

SUBJECT: Status Report on Lake Elsinore Water Quality Restoration Activities

Background

As depicted in the attached Figure, Lake Elsinore, located within the City of Lake Elsinore in southwest Riverside County, is a natural low point of the San Jacinto River and its drainage basin. The total drainage basin of the San Jacinto River watershed is approximately 782 square miles. Over 90 percent of the watershed (735 square miles) drains first into Railroad Canyon Reservoir (Canyon Lake). The local tributary area to Lake Elsinore, consisting of drainage from the Santa Ana Mountains to the west and the City of Lake Elsinore, is 47 square miles.

Lake Elsinore is a relatively shallow lake with a large surface area. At the current lake outlet sill elevation of 1,255 feet, the lake has an average depth of 24.7 feet and a surface area of 3500 acres. Annual average precipitation in the Lake Elsinore watershed is approximately 11.6 inches; average annual evaporative loss is 56.2 inches. This excessive evaporation loss compared to the low natural inflow results in very unstable lake levels. At the extreme, Lake Elsinore was completely dry in the 1950s and 1960s. Lake Elsinore overflows into Temescal Creek Only in extremely wet years (1919, 1981, 1983, 1993, and 1995).

The most severe water quality problem of Lake Elsinore is hypereutrophication, or the over-enrichment of the lake with nutrients (phosphorus and nitrogen). Elevated nutrient levels result in high algal productivity, leading to algal blooms and low dissolved oxygen levels that in turn result in fish kills. Algae respiration and decay requires the uptake of dissolved oxygen in the water column, which results in excessive oxygen depletion that adversely affects aquatic biota, including fish. The decay of dead algae and fish also produces offensive odors and an unsightly lakeshore, adversely affecting use of the Lake for recreational purposes. In addition, the massive amount of algal cells causes high turbidity in the lake, making the water an uninviting murky green color at times.

As a result of the history of fish kills and algae blooms in Lake Elsinore, in 1994, the Regional Board placed Lake Elsinore on the Clean Water Act Section 303(d) list of impaired waterbodies for nutrient inputs. For any waterbody listed on the Section 303(d) list, federal law requires that a total maximum daily load (TMDL) be established to address the impairment. Regional Board staff and various watershed stakeholders have been working on the nutrient TMDL for Lake Elsinore for the past year. As the first step in the TMDL process, Regional Board staff prepared and presented the Lake Elsinore Nutrient TMDL Problem Statement in October 2000. Based on the evaluation of existing data, phosphorus that is bound in the Lake sediment and released to the water column during the warm summer months is the primary nutrient source to Lake Elsinore. The build-up of phosphorus rich sediment is the result of nutrient laden wet weather inflows from the watershed.

Lake Elsinore and San Jacinto River Watershed Joint Powers Authority

In March 1999, the voters of California passed Proposition 13. One of the provisions in the bond was an award of \$15,000,000 for restoration of Lake Elsinore and the San Jacinto River Watershed. A Joint Powers Authority (JPA) was formed to manage and plan for Lake and watershed restoration activities using these funds. The members of the JPA include the City of Lake Elsinore, the City of Canyon Lake, the Santa Ana Watershed Project Authority (SAWPA), the County of Riverside, and Elsinore Valley Municipal Water District (EVMWD). Under the supervision of the JPA Board, a Technical Advisory Committee (TAC) was formed from the JPA member agencies. Regional Board staff have been active participants at the JPA TAC, since the TMDL-related activities are directly related to the Lake and watershed restoration activities.

Among potential Lake management alternatives, several are being considered by the JPA for Lake Elsinore restoration, including alum treatment, metal salt addition, treatment wetland construction, biomanipulation and supplementing the water supply to the Lake. A summary of each management alternative was provided in the October 2000 Problem Statement; because alum treatment and the efforts to obtain a supplemental water supply for the Lake are the current activities of the JPA, this update will focus only on these efforts.

Alum treatment

Alum treatment consists of the addition of aluminum sulfate (alum) to the lake water. Alum combines with the phosphate ions in the water column and precipitates on the lake bottom. If an appropriate dosage of alum is added, the soluble phosphorus will be removed from the water column. The precipitate forms a thin layer on the top of the lake sediment, acting as a barrier to prevent the release of phosphorus to the water column under anoxic conditions. However, there are limitations on the long-term benefits of alum treatment. If phosphorus inputs to the Lake are not controlled, the alum layers will be buried underneath the new lake sediment that is rich in phosphorus, and thus, the effect of the alum treatment is lost. The success of alum treatment on other lakes demonstrates that, if the other sources of phosphate are not controlled, alum treatment loses 70% of its effectiveness in five years, and 100% of its effectiveness in seven years.

The JPA has been working on the steps necessary to move forward with alum application. Efforts include obtaining a noted alum treatment specialist to provide input on alum dosage requirements, etc.; soliciting proposals for alum treatment contractors; and securing funding through Proposition 13. The JPA is proposing to apply the alum on limited areas with high phosphorus levels in the sediment, at a cost of approximately \$1,200,000. Serving as lead agency, the City of Lake Elsinore recently circulated a draft EIR evaluating the impacts of alum treatment (as well as the other restoration options). Regional Board staff is in the process of preparing comments on the draft EIR.

It is important to note that in moving forward with alum treatment for Lake Elsinore, the JPA recognizes that the benefits of alum treatment may be short-lived. If heavy winter rains occur after alum application, additional phosphorus inputs to the lake could negate the benefits of the alum. In addition, there is the potential for bottom dwelling fish to disturb the alum layer, resulting in the release of phosphorus. Furthermore, the fish themselves add to the nutrient load by excreting phosphorus. The JPA is in the process of evaluating fish removal options including the netting the fish or the use of the aquatic pesticide rotenone. Despite these drawbacks of alum treatment, the JPA has decided to move forward with this treatment to obtain short-term water quality improvements of Lake Elsinore.

Supplemental Water Supply to Lake Elsinore

As previously mentioned, in one year alone, Lake Elsinore can lose approximately 4.5 feet of water, or 11,000 acre-feet of water due to evaporation. Over a long time-span, there is usually insufficient water coming from the watershed to compensate for the evaporative losses. As a result, Lake Elsinore can become dry, such as occurred during the 1950s and 1960s. Despite the existence of a 1927 agreement (Tilly agreement) between the City of Lake Elsinore and EVMWD, there has been no effort to maintain the water level at 1240 feet as specified in the agreement. In 1967, the State Parks and Recreation District (then the owners of Lake Elsinore) installed three deep wells (the so-called "Island Wells") to pump groundwater to provide supplemental water to the Lake. After State Parks relinquished its ownership of Lake Elsinore to the City of Lake Elsinore in 1992, the three wells were handed over to the EVMWD. The source of supplemental water to the Lake has been uncertain ever since. In order to restore and maintain the beneficial uses of Lake Elsinore, it is critical to maintain a stable water level. Regional Board staff believes that, without maintaining a stable water level, the long-term success of any of the restoration alternatives being considered would be uncertain.

EVMWD is evaluating the use of the three Island Wells to provide a water supply to the Lake. These wells are not currently used as a potable supply because there is no pipeline to the wells to allow connection to EVMWD's distribution system. EVMWD has recently submitted water quality data from the three wells for Regional Board staff review. We have requested additional water quality analysis to evaluate if the well water is of acceptable quality for use in Lake Elsinore.

Another potential source of water supply for the Lake is recycled water. The use of recycled water in the lake, however has been very controversial. To evaluate the use of recycled water in the Lake, the citizens of Elsinore Valley formed a Task Force. The Task Force members include citizens of City of Lake Elsinore, City of Lake Elsinore officials, EVMWD Board members, and Regional Board staff. In 1997, a white paper was prepared by the Task Force evaluating the recycled water alternative. As discussed in the White Paper, the use of recycled water as a source of supplemental water supply for the Lake was agreed upon by all members, as long as the phosphorus levels were kept to 0.2 mg/L (typical wastewater discharges of phosphorus are in the 2-3 mg/L range; this new source of phosphorus would have to be taken into account in the TMDL development process). EVMWD has prepared a Feasibility Study Report that evaluates the feasibility of using recycled water as a supplemental water supply for Lake Elsinore. To offset the addition of nutrients to Lake Elsinore via recycled water, EVMWD has proposed two mitigation measures. The first is to mitigate the additional nutrient input by expanding and reconfiguring the existing wetlands in the Back Basin. The wetlands would provide additional nutrient treatment to recycled water prior to discharge to Lake Elsinore. During the summer seasons, Lake water would be circulated through the wetlands to remove nutrients and algal particles. The additional mitigation measure being proposed is aeration of the Lake. Aeration would reduce phosphorus release from the sediment and reduce fish kills.

In addition to the Feasibility Study Report, the City of Lake Elsinore and EVMWD have been working cooperatively to explore the recycled water option for the Lake. We are unclear on the status of these discussions. In Board staff's view, we believe that recycled water is likely the only long-term reliable solution to maintain a stable water level in Lake Elsinore. Accordingly, Board staff will continue to work very closely with EVMWD and the City of Lake Elsinore to identify and obtain a reliable water source for Lake Elsinore.

Regional Board TMDL Development Activities

Regional Board staff initiated the Lake Elsinore nutrient TMDL development process in the fall of 1999. Development of the TMDL is expected to continue through 2003. The TMDL development process was started with an extensive monitoring program to determine all of the nutrient sources in the watershed and the nutrient loads associated with each source. Board staff, in coordination with watershed stakeholders¹, have developed and implemented an extensive watershed-wide monitoring program. Because of the importance of developing the TMDL, identifying nutrient sources and targeting development of implementation programs to address nutrient inputs through the TMDL process, the JPA is providing funding to support the TMDL monitoring program.

Summary

There are a variety of programs being undertaken to address nutrient impairment of Lake Elsinore. Board staff believes that controlling nutrient input in the watershed is needed long-term. Short term goals for the Lake should be to identify a reliable water supply in order to maintain the lake level and to address the sediment phosphorus load. We believe that there is a real opportunity now to make short- and long-term progress on water quality and beneficial use improvement in Lake Elsinore. Proposition 13 has made project funding available, and additional TMDL funds were allocated to the Board, enabling staff to initiate TMDL efforts earlier than expected. However, the success of all these efforts relies on cooperation and commitment by all the watershed stakeholders.

¹ Stakeholders consistently and actively involved in the TMDL development process include the Santa Ana Watershed Project Authority (SAWPA), Eastern Municipal Water District, the City of Lake Elsinore, EVMWD, the City of Canyon Lake, Riverside County Flood Control and Water Conservation District, the City of Moreno Valley, and Elsinore-Murrieta Resource Conservation District. Participation by the dairy industry groups (Milk Producers Council and the Western Dairymen Association), The Farm Bureau, and the March Joint Powers Authority has been sporadic. There has been no participation by other watershed municipalities (Cities of Perris, Hemet, Sun City, and San Jacinto).